

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-726

Anonymous Referee #1

Referee comment on "Estimation of the vertical distribution of particle matter (PM_{2.5}) concentration and its transport flux from lidar measurements based on machine learning algorithms" by Yingying Ma et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-726-RC1>, 2021

Comment on "Estimation of the vertical distribution of particle matter (PM_{2.5}) concentration and its transport flux from lidar measurements based on machine learning algorithms" by Y. Ma et al.

Vertical distribution of PM_{2.5} and its flux are of great importance to evaluate its impacts on environment, climate as well as human health. The article proposes a new method for estimating vertical distribution of PM_{2.5} concentration from active remote sensing observation based on ML algorithms. The topic is of sufficient interest to the communities of study of atmospheric aerosol and environments. In general, I find this manuscript to be of interest for publication and appropriate for *Atmospheric Chemistry and Physics*. There are several suggestions for improvement listed below that should be considered by the authors and the editors before publication.

- P3, line 17, the abbreviation of "unmanned aerial vehicle" should be added.
- P6, Line 7, is the R2 the correlation coefficient or determination coefficient? please confirm it.
- P8, Line 16, please clarify the level of significance test.
- P9, Line 8-9, "we randomly pick 90% (4,807) as a training dataset, and the remaining 10% (535) as the testing dataset." I am confused the method of picking the training and testing dataset, please focused two questions: 1) After multiply and randomly picking samples, do the so-called remaining 10% samples participate in the model training? Or are the 10% not involved in the training of the model at all times? If the first one, this means that the predictive performance these models are unreliable.

Please give the detailed explanation.

- About the validation of model training in section 3.3 and the evaluation of predictive power in section 4.1, the authors should consider more methods, e.g. sample-based 10-fold cross-validation.
- P12, Formula (5), please give the unit of transport flux in the corresponding context so as to understand it conveniently, because the unit of transport flux at a certain height is different from that of column-integrated transport flux.
- P13, Line 24, model à models
- Section 5 should be rewritten. This section is just repeating some statements that have been made in the previous sections. In a good conclusion, the authors should interpret all the findings and even discussion with a higher level of abstraction.